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## Space Weathering on Icy Satellites in the Outer Solar System

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Space weathering produces well-known optical effects in silicate minerals in the inner Solar System, for example, on the Moon. Space weathering from solar wind and UV is expected to be significantly weaker in the outer Solar System simply because intensities are low. However, cosmic rays and micrometeoroid bombardment would be similar to first order. That, combined with the much higher volatility of icy surfaces means there is the potential for space weathering on icy outer Solar System surfaces to show optical effects. The Cassini spacecraft orbiting Saturn is providing evidence for space weathering on icy bodies. The Cassini VIMS instrument has spatially mapped satellite surfaces and the rings from 0.35-5 microns and the UVIS instrument from 0.1 to 0.2 microns. These data have sampled a complex mixing space between H<sub>2</sub>O ice and non-ice components and they show some common spectral properties. Similarly, spectra of the icy Galilean satellites and satellites in the Uranian system have some commonality in spectral properties with those in the Saturn system. The UV absorber is spectrally similar on many surfaces. VIMS has identified CO<sub>2</sub>, H<sub>2</sub> and trace organics in varying abundances on Saturn's satellites. We postulate that through the spatial relationships of some of these compounds that they are created and destroyed through space weathering effects. For example, the trapped H<sub>2</sub> and CO<sub>2</sub> observed by VIMS in regions with high concentrations of dark material may in part be space weathering products from the destruction of H<sub>2</sub>O and organic molecules. The dark material, particularly on Iapetus which has the highest concentration in the Saturn system, is well matched by space-weathered silicates in the .4-2.6 micron range, and the spectral shapes closely match those of the most mature lunar soils, another indicator of space weathered material.